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PTO/SB/05 (12/97)

Approved for use through 09/30/00. OMB 0651-0032

Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 42390.P4264

Total Pages 5

First Named Inventor or Application Identifier Rajendra S. Yavatkar

Express Mail Label No. EM 502097204 US

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, D. C. 20231

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. X Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)
2. X Specification (Total Pages 23)
(preferred arrangement set forth below)
 - Descriptive Title of the Invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the Invention
 - Brief Summary of the Invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claims
 - Abstract of the Disclosure
3. X Drawings(s) (35 USC 113) (Total Sheets 5)
4. X Oath or Declaration (Total Pages 4) Signed
 - a. X Newly Executed (Original)
 - b. Copy from a Prior Application (37 CFR 1.63(d))
(for Continuation/Divisional with Box 17 completed) (Note Box 5 below)
 - i. DELETIONS OF INVENTOR(S) Signed statement attached deleting
inventor(s) named in the prior application, see 37 CFR 1.63(d)(2)
and 1.33(b).
5. Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a copy of the oath or
declaration is supplied under Box 4b, is considered as being part of the
disclosure of the accompanying application and is hereby incorporated by
reference therein.

03044379 03044379

6. _____ Microfiche Computer Program (Appendix)

7. _____ Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)

- a. _____ Computer Readable Copy
b. _____ Paper Copy (identical to computer copy)
c. _____ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. X Assignment Papers (cover sheet & documents(s))

9. a. 37 CFR 3.73(b) Statement (where there is an assignee)

X b. Power of Attorney

10.	English Translation Document (if applicable)
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11. a. Information Disclosure Statement (IDS)/PTO-1449

b. Copies of IDS Citations

12. Preliminary Amendment

13.	X	Return Receipt Postcard (MPEP 503) (Should be specifically itemized)
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14. a. Small Entity Statement(s)

b. Statement filed in prior application, Status still proper and desired

15. _____ Certified Copy of Priority Document(s) (if foreign priority is claimed)

16. X Other: Separate sheet: Certificate of mailing, attorney signature and registration
number and copy of return postcard

17. If a **CONTINUING APPLICATION**, check appropriate box and supply the requisite information:

Continuation Divisional Continuation-in-part (CIP)

of prior application No: _____

18. **Correspondence Address**

Customer Number or Bar Code Label

(Insert Customer No. or Attach Bar Code Label here)

or

X	Correspondence Address Below
----------	------------------------------

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FEE TRANSMITTAL

TOTAL AMOUNT OF PAYMENT (\$)	<u>\$1088.00</u>
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Complete if Known:

Application No.

Filing Date March 13, 1998

First Named Inventor Rajendra S. Yavatkar

Group Art Unit _____

Examiner Name _____

Attorney Docket No. **42390.P4264**

METHOD OF PAYMENT (check one)

1.	[]	The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:
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Deposit Account Number 02-2666

Deposit Account Name _____

☒ Charge Any Additional Fee Required Under 37 CFR 1.16 and 1.17

[] Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance, 37 CFR 1.131(b)

2. X Payment Enclosed

X	Check
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Money Order

Other

FEE CALCULATION (fees effective 10/01/97)

1. FILING FEE

<u>Large Entity</u>		<u>Small Entity</u>			
<u>Fee</u>	<u>Fee</u>	<u>Fee</u>	<u>Fee</u>		
<u>Code</u>	<u>(\$)</u>	<u>Code</u>	<u>(\$)</u>	<u>Fee Description</u>	<u>Fee Paid</u>
101	790	201	395	Utility application filing fee	\$790.00
106	330	206	165	Design application filing fee	
107	540	207	270	Plant filing fee	
108	790	208	395	Reissue filing fee	
114	150	214	75	Provisional application filing fee	

SUBTOTAL (1) \$ 790.00

2. CLAIMS

2. CLAIMS					Fee from	
			<u>Extra</u>		<u>below</u>	<u>Fee Paid</u>
Total Claims	<u>28</u>	- 20 =	<u>8</u>	X	<u>22</u>	= \$176.00
Independent Claims	<u>4</u>	- 3 =	<u>1</u>	X	<u>82</u>	= \$ 82.00
Multiple Dependent Claims				X		=

<u>Large Entity</u>		<u>Small Entity</u>			
Fee	Fee	Fee	Fee		
Code	(\$)	Code	(\$)	<u>Fee Description</u>	<u>Fee Paid</u>
103	22	203	11	Claims in excess of twenty	<u>\$176.00</u>
102	82	202	41	Independent claims in excess of 3	<u>\$ 82.00</u>

104	270	204	135	Multiple dependent claim	_____
109	82	209	41	Reissue independent claims over original patent	_____
110	22	210	11	Reissue claims in excess of 20 and over original patent	_____
SUBTOTAL (2)					\$ 258.00

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity		Small Entity		Fee Description	Fee Paid
Code	Fee (\$)	Code	Fee (\$)		
105	130	205	65	Surcharge - late filing fee or oath	_____
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	_____
139	130	139	130	Non-English specification	_____
147	2,520	147	2,520	For filing a request for reexamination	_____
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	_____
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	_____
115	110	215	55	Extension for response within first month	_____
116	400	216	200	Extension for response within second month	_____
117	950	217	475	Extension for response within third month	_____
118	1,510	218	755	Extension for response within fourth month	_____
128	2,060	228	1,030	Extension for response within fifth month	_____
119	310	219	155	Notice of Appeal	_____
120	310	220	155	Filing a brief in support of an appeal	_____
121	270	221	135	Request for oral hearing	_____
138	1,510	138	1,510	Petition to institute a public use proceeding	_____
140	110	240	55	Petition to revive unavoidably abandoned application	_____
141	1,320	241	660	Petition to revive unintentionally abandoned application	_____
142	1,320	242	660	Utility issue fee (or reissue)	_____
143	450	243	225	Design issue fee	_____
144	670	244	335	Plant issue fee	_____
122	130	122	130	Petitions to the Commissioner	_____
123	50	123	50	Petitions related to provisional applications	_____
126	240	126	240	Submission of Information Disclosure Stmt	_____
581	40	581	40	Recording each patent assignment per property (times number of properties)	\$40.00
146	790	246	395	For filing a submission after final rejection (see 37 CFR 1.129(a))	_____
149	790	249	395	For each additional invention to be examined (see 37 CFR 1.129(a))	_____
Other fee (specify) _____					_____
Other fee (specify) _____					_____
SUBTOTAL (3)					\$40.00

*Reduced by Basic Filing Fee Paid

SUBMITTED BY:

Typed or Printed Name: Aloysius T. C. AuYeung

Signature Aloysius T. C. AuYeung Date 3/13/98

Reg. Number 35,432 Deposit Account User ID _____

(complete if applicable)

Express Mail Label: EM 502097204 US

12/01/97

- 2 -

PTO/SB/17 (10-96)

Approved for use through 09/30/98 OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

ENSURING QUALITY OF SERVICE (QOS) FOR A MULTI-MEDIA CALL THROUGH CALL ASSOCIATED INDIVIDUAL MEDIA STREAM BANDWIDTH CONTROL

Inventors: Rajendra S. Yavatkar, James E. Toga

Respectfully submitted,

BLAKELY SOKOLOFF TAYLOR & ZAFMAN LLP



Aloysius T. C. AuYeung
Reg. No. 35,432

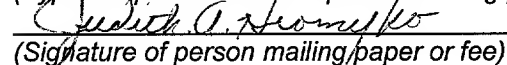
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(Signature of person mailing paper or fee)

3/13/98
(Date signed)

Serial/Patent No.: *****	Filing/Issue Date: *****
Client: INTEL CORPORATION	Inventors: Yavatkar, Toga
Title: ENSURING QUALITY OF SERVICE (QOS) FOR A MULTI-MEDIA CALL THROUGH CALL ASSOCIATED INDIVIDUAL MEDIA STREAM BANDWIDTH CONTROL	
BSTZ File No.: 42390.P4264	Atty/Secty Initials: ATA/jh
Date Mailed: March 13, 1998	Docket Due Date: *****

The following has been received in the U.S. Patent & Trademark Office on the date stamped hereon:

<input type="checkbox"/> Amendment/Response (____ pgs.)	<input checked="" type="checkbox"/> Express Mail No. EM502097204US	<input checked="" type="checkbox"/> Check No. 4858
<input type="checkbox"/> Appeal Brief (____ pgs.) (in triplicate)	<input type="checkbox"/> _____ Month(s) Extension of Time	Amt: \$1088.00
<input checked="" type="checkbox"/> Application - Utility (23 pgs., with cover and abstract)	<input type="checkbox"/> Information Disclosure Statement & PTO-1449 (____ pgs.)	<input type="checkbox"/> Check No. _____
<input type="checkbox"/> Application - Rule 1.60 Continuation (____ pgs.)	<input type="checkbox"/> Issue Fee Transmittal	Amt: _____
<input type="checkbox"/> Application - Rule 1.60 Division (____ pgs.)	<input type="checkbox"/> Notice of Appeal	
<input type="checkbox"/> Application - Rule 1.60 CIP (____ pgs.)	<input type="checkbox"/> Petition for Extension of Time	
<input type="checkbox"/> Application - Rule 1.62 Transmittal (____ pgs.)	<input type="checkbox"/> Petition for _____	
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<input type="checkbox"/> Application - PCT (____ pgs.)	<input type="checkbox"/> Power of Attorney (____ pgs.)	
<input type="checkbox"/> Application - Provisional (____ pgs.)	<input type="checkbox"/> Preliminary Amendment (____ pgs.)	
<input checked="" type="checkbox"/> Assignment and Cover Sheet Signed	<input type="checkbox"/> Reply Brief (____ pgs.)	
<input checked="" type="checkbox"/> Certificate of Mailing	<input type="checkbox"/> Response to Notice of Missing Parts	
<input checked="" type="checkbox"/> Declaration & POA (4 pgs.) Signed	<input type="checkbox"/> Request to Incorporate Disclosure Document (____ pgs.)	
<input type="checkbox"/> Disclosure Docs & Orig & Copy of Inventor's Signed Letter (____ pgs.)	<input type="checkbox"/> Small Entity Declaration for Indep. Inventor/Small Business	
<input checked="" type="checkbox"/> Drawings: 5 # of sheets includes 9 figures	<input checked="" type="checkbox"/> Transmittal Letter (original & copy)	

☒ Other: **Fee transmittal - 2 pgs (original & copy)**
**Separate sheet: Certificate of mailing, attorney
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return postcard**

RECEIVED 6/15/98

APPLICATION FOR UNITED STATES LETTERS PATENT

FOR

**Ensuring Quality Of Service (QOS) For A Multi-Media Call
Through Call Associated Individual Media Stream
Bandwidth Control**

Inventor(s): **Rajendra S. Yavatkar**
James E. Toga

Prepared by:

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**Ensuring Quality Of Service (QOS) For A Multi-Media Calls Through
Call Associated Individual Media Stream Bandwidth Control**

BACKGROUND OF THE INVENTION

5

1. **Field of the Invention**

The present invention relates to the field of multi-media calls. More specifically, the present invention relates to the quality of service of multi-media
10 calls.

2. **Background Information**

As advances in microprocessor and other related technologies
15 continue to improve the price/performance of various electronic components, multi-media calls, such as video conferencing calls, including those calls conducted using personal computers (PC), have become increasingly popular in recent years.

Numerous PC based multi-media call products designed to take advantage of the increased processing power of today's PCs are now available in the market place.

20 An example of such multi-media call products is the ProShare™ Video Conferencing product, available from Intel Corp., of Santa Clara, CA., the assignee of the present invention.

At the same time, with the advances in networking technology,
25 increasing number of computers are connected to one another via private and public networks, such as the Internet, resulting in increasing number of multi-media calls

being conducted over the various networks. Many of these networks, such as the Internet, are packet based and “best effort” type of networks. That is, end to end delivery for a packet can take any arbitrary amount of time, and there is no guarantee that the delivery time will be smaller than the latency requirement. Since
5 the media packets of multi-media are isochronous in nature, as a result, the quality of service (QOS) for these multi-media calls cannot be guaranteed.

Recommendation H.323 of the International Telecommunication Union – Technical Section (ITU-T), entitled “Packet Based Multi-Media Communication
10 System”, published 11/96, provides for call level admission control into a local area network (LAN) that allows a call to be denied access into the LAN due to its bandwidth limitation. The provision prevents the LAN from being overloaded, and partially addresses the QOS issue. However, potential bandwidth limitations of the intermediate hops remain a problem. Furthermore, merely managing a LAN’s
15 bandwidth at the call level often results in waste, as there is no correlation to the actual bandwidth consumption by the media streams of the calls. Notwithstanding these shortcomings, for interoperability reason, increasing number of multi-media call products have implemented support for H.323. Thus, a more efficient and/or effective approach to guaranteeing the QOS of a multi-media call that is compatible
20 with the H.323 recommendation is desired.

SUMMARY OF THE INVENTION

A multi-media call application is disclosed. The application guarantees quality of service (QOS) for a packet based multi-media call (CALL). The guaranty
5 is effectuated through call associated individual media stream bandwidth control.

BRIEF DESCRIPTION OF DRAWINGS

10 The present invention will be described by way of exemplary embodiments, but not limitations, illustrated in the accompanying drawings in which like references denote similar elements, and in which:

Figure 1 illustrates an exemplary network suitable for practicing the present invention;

15 **Figure 2** is a block diagram illustrating one embodiment of the method of the present invention; and

Figures 3a-3g are block diagrams illustrating one embodiment each of various bandwidth reservation related messages of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, various aspects of the present invention will be described. Those skilled in the art will also appreciate that the present invention may be practiced with only some or all aspects of the present invention. For purposes of explanation, specific numbers, materials and configurations are set forth in order to provide a thorough understanding of the present invention. However, it will also be apparent to one skilled in the art that the present invention may be practiced without the specific details. In other instances, well known features are omitted or simplified in order not to obscure the present invention.

Parts of the description will be presented in terms of operations performed by a computer system, using terms such as data, flags, bits, values, characters, strings, numbers and the like, consistent with the manner commonly employed by those skilled in the art to convey the substance of their work to others skilled in the art. As well understood by those skilled in the art, these quantities take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, and otherwise manipulated through mechanical and electrical components of the computer system; and the term computer system include general purpose as well as special purpose data processing machines, systems, and the like, that are standalone, adjunct or embedded.

Various operations will be described as multiple discrete steps in turn in a manner that is most helpful in understanding the present invention, however, the order of description should not be construed as to imply that these operations are necessarily order dependent, in particular, the order of presentation.

Referring now to **Figure 1**, wherein a block diagram illustrating an exemplary network suitable for practicing the present invention. As illustrated, exemplary network **100** includes client computer **102**, sub-net bandwidth manager **104** and router **108** coupled to each other through medium **110**. Additionally, for the illustrated embodiment, exemplary network **100** includes gatekeeper **106** and gateway **107** coupled to each other and the earlier enumerated elements as shown.

Medium **110** facilitates communication between the coupled elements. For the illustrated embodiment, communication is conducted on a packet basis. The packet based communication may be conducted using any one of a number of protocols known in the art. Medium **110** may be any networking medium and signaling scheme suitable for such packet based communication. An example is the twisted pair medium with electrical signals propagated in accordance with IEEE's 802.3 standard, titled Local Area Network (LAN): Carrier Sense Multiple Access With Collision Detection CSMA/CD (commonly known as Ethernet), published 1985.

Router **108** facilitates internetworking communication between client computer **102**, SBM **104**, and so forth, with members of other networks. Router **108** is intended to represent a broad category of such elements known in the art, including like elements such as switches, bridges, and so forth.

SBM **104** manages bandwidth of network **100**. SBM **104** controls admission of traffic into network **100**, including admission by traffic class and reservation of bandwidth for the admitted traffic class. Additionally, SBM **104** in cooperation with other SBMs of other interconnected network enable end-to-end

bandwidth reservation on all intermediate hops, from one end to another end of a traffic flow. In one embodiment, SBM **104** manages bandwidth of network **100** and cooperates with other SBMs in accordance with SBM (Subnet Bandwidth Manager): A Protocol for RSVP-based Admission Control over IEEE 802-style networks, draft IETF-ISSL-IS802-SBM-06.TXT, published March, 1998. SBM **104** may be implemented using any one of the servers known in the art. An example of such servers is a Pentium® II processor based server, such as the PowerEdge server available from Dell Computer of Texas. Pentium is a registered trademark of Intel Corp., assignee of the present invention. SBM **104** may also be implemented as a switch or router, such as element **108** described earlier.

Client computer **102** is equipped to enable a user to conduct a packet based multi-media call with a counterpart located at another end point over one or more interconnected networks. Client computer **102** includes in particular multi-media call application **112** and bandwidth reservation service **114**. Multi-media call application **112** provides the user with the ability to conduct the multi-media call. Multi-media application **112** conducts the multi-media call using multiple media streams, sending and receiving each media stream over individualized logical channel. For the illustrated embodiment, multi-media application **112** is a video conferencing application that enables the user to conduct video conference calls. The video conferencing application conducts the video conference calls in accordance with ITU-T's H.323 recommendation, using multiple audio and video streams sent and received over individualized logical channels. Additionally, in accordance with the present invention, multi-media application **112** in cooperation with bandwidth reservation service **114** ensure quality of service (QOS) of the multi-media call using call associated individual media stream bandwidth control, to be

described more fully below. Except for the teachings of the present invention incorporated in multi-media call application **112** and bandwidth reservation service **114**, client computer **102** including multi-media application **112** and bandwidth reservation service **114** are intended to represent a broad category of these elements known in the art. An example of client computer **102** is a Pentium® II processor based multi-media computer, such as the Dimension PCs available from Dell Computer. An example of multi-media call application **112** is earlier described ProShare® Video Conferencing product, available from Intel Corp. An example of bandwidth reservation service **114** is the PC RSVP product, also available from Intel Corp. In an alternate embodiment, bandwidth reservation service **114**, including the incorporated teachings of the present invention, is an integral part of the operating system of client computer **102**. Examples of such operating system that can include bandwidth reservation service **114** include the Windows® family of operating systems, e.g. Windows® 95, Windows® NT and so forth.

Gatekeeper **106**, for the illustrated embodiment, facilitates call level admission control into network **100** for H.323 compliant multi-media calls between end points coupled to network **100**, such as client computer **102**, and end points outside network **100**. Gateway **107** provides real-time, two-way communications between the above described end-points including but not limited to translation of transmission formats. Both gatekeeper **106** and gateway **107** facilitate the call level admission control and real time communication respectively in accordance with ITU-T's H.323 recommendation. Gatekeeper **106** as well as gateway **107** may also be implemented using one or more of a number of servers known in the art.

Referring now also to **Figure 2**, wherein one embodiment of the method step of the present invention is shown. As illustrated, to ensure the QOS of the multi-media call, multi-media call application **112** first reserves bandwidth for the multi-media call through SBM **104** while establishing a connection for the multi-media call, steps **202-208**. In alternate embodiments, the call level bandwidth reservation may be made independent of establishing a connection for the multi-media call. Multi-media application **112** then subsequently causes SBM **104** to allocate the reserved call level bandwidth to individual media streams of the multi-media call while establishing logical channels for the individual media streams during the multi-media call, step **212**. In alternate embodiments, the allocation of the reserved call level bandwidth to individual media streams may be caused independent of establishing logical channels for the individual media streams. At call termination, multi-media call application **112** notifies SBM **104** of the termination of the call to release the call level bandwidth reservation, while tearing down the connection for the multi-media call, step **214**.

For the illustrated embodiment, at steps **202-208**, multi-media application **112** first determines whether gatekeeper **106** is present in network **100**, step **202**. If gatekeeper **106** is present, multi-media application **112** registers the multi-call call with gatekeeper **106**, in a manner that causes gatekeeper **106** to determine whether to admit the multi-media call into network **100** without taking into consideration the multi-media call's bandwidth requirement, step **204**. The discovery of gatekeeper **106** may be accomplished through any one of a number of known methods, including but not limited to referencing a statically stored value and address of its controlling gatekeeper at a predetermined location, or issuing queries on network **100** to solicit response from gatekeeper **106**. In one embodiment, the

required manner of registration is accomplished by registering the multi-media call with gatekeeper **106** and requesting gatekeeper **106** to set aside zero bandwidth for the multi-media call. This conditional registration enables the present invention to be practiced for H.323 compliant multi-media calls, especially when a H.323
5 compliant gatekeeper is present in the network to which client computer **102** is attached.

Upon either determining that gatekeeper **106** is not present in network **100** or registering the multi-media call with gatekeeper **106** in the required manner,
10 multi-media application **112** determines if SBM **102** is present in network **100**, step **206**. If SBM **102** is not present, multi-media application **112** continues the call as in the prior art, i.e. with QOS guaranty for the multi-media call, step **208**. On the other hand, if SBM **102** is present, multi-media application **112** registers the call with SBM **102** and requesting SBM **102** to reserve bandwidth for the multi-media call, step
15 **210**. In response, if sufficient bandwidth exists in network **100**, SBM **102** admits the multi-media call and reserves the requested bandwidth in network **100**. If insufficient bandwidth exists in network **100**, SBM **104** rejects the request. In one embodiment, the bandwidth reservation is accomplished by SBM **104** in accordance with the above described SBM protocol, with new messages defined in accordance
20 with the present invention, to be described more fully below. In one embodiment, if the call level bandwidth reservation with SBM **104** is rejected, multi-media application **112** continues the multi-media call without QOS guaranty, step **208**. In an alternate embodiment, multi-media application **112** terminates the multi-media call for insufficient network resources.

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At step **212**, while establishing a logical channel for the media stream, if the multi-media call was admitted by SBM **104**, multi-media call application **112** calls bandwidth reservation service **114** to request SBM **104** to allocate a portion of the call level bandwidth reservation for a media stream. Multi-media call application

5 **112** provides call level information to bandwidth reservation service **114** for inclusion in the request, such that SBM **104** can associate the media stream with the appropriate call level bandwidth reservation. The call level information include call type, e.g. H.323, call ID, and endpoint ID. Endpoint ID includes information such as Internet Protocol (IP) address, protocol ID and port number. The request to

10 bandwidth reservation service **114** may be made in any one of a number of known inter-program communication techniques. In alternate embodiments, multi-media call application **112** may perform this request itself. However, in a bandwidth managed network, it is likely such bandwidth reservation service will be provided by either a utility or as an integral part of the operating system, as more than one

15 application will likely want to leverage on the fact that the network bandwidth is being managed. Thus, it is more efficient to effectuate the desired allocation by invoking the common service.

In response, bandwidth reservation service **114** requests SBM **104** to

20 allocate a portion of the call level bandwidth reservation to the media stream, including the call level information in the request to enable SBM **104** to associate the media stream with the appropriate call level bandwidth reservation. In the above described embodiment where bandwidth reservation service **114** is implemented using PC-RSVP, communications between PC-RSVP and SBM **104** are conducted

25 using conventional RSVP messages. In turn, SBM **104** makes the allocation accordingly in network **100**, as well as requests networking equipment of the

intermediate hops to do so through SBMs of the interconnected networks of the intermediate hops. As a result, QOS of the multi-media call can be ensured. For the illustrated embodiment, communications between SBM **104** and SBMs of the interconnected networks of the intermediate hops are conducted using messages and protocol in accordance with the above described SBM protocol.

In one embodiment, SBM **104** also provides feedback to multi-media application **112** through bandwidth reservation service **114** if it fails to establish end-to-end bandwidth reservation for an individual media stream. In response, multi-media application **112** adjusts the operating parameters of the multi-media call to ensure the user continues to perceive performance commensurate with QOS guaranteed, e.g. temporarily slowing down video refresh rate, or switching to periodic still images as opposed to live video and so forth. In one embodiment, multi-media call application **112** may also adjust the call level bandwidth reservation with SBM **104** during the multi-media call. In one embodiment, the call level reservation is treated by SBM **104** as a “soft” reservation. If the reserved bandwidth is not being used for a predetermined period, e.g. multi-media application **112** fails to cause the reserved bandwidth to be allocated to individual media streams within the time period, SBM **104** releases the reservation.

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Figure 3a illustrates one embodiment of a discovery packet for use by multi-media application **112** to discover the presence of SBM **104** in network **100**. For the illustrated embodiment, discovery packet **302** includes common header **301** (to be described more fully below) and client computer’s IP address **304**. In one embodiment, discovery packet **302** is sent to a predetermined IP multi-cast address and a predetermined User Datagram Protocol (UDP) port number with the

25

“IP_MULTICAST_TTL” value set to 1. **Figure 3b** illustrates one embodiment of a response packet for use by SBM 104 to respond to the multi-media call application’s discovery packet. For the illustrated embodiment, response packet 312 includes common header 301, SBM’s IP address 314, and a UDP port number 316 at which SBM 104 listens for incoming requests.

Figure 3c illustrates one embodiment of a call level bandwidth reservation packet for use by multi-media application 112 to reserve call level bandwidth reservation or subsequently modify the reservation with SBM 104. For the illustrated embodiment, call level bandwidth reservation/modification packet 322 includes common header 301, call family identifier 324, call identifier 326, endpoint identifier 328 and bandwidth requirement 330. Call family identifier 324 specifies the call class, e.g. H.323. Call identifier 326 uniquely identifies the multi-media call. End-point identifier 328 uniquely identifies the “requester” of the call level bandwidth, including e.g. IP address and port number of client computer 102 as well as a protocol ID. Bandwidth requirement 330 specifies the call level bandwidth requested, e.g. in bits per second. **Figure 3d** illustrates one embodiment of a call level bandwidth request confirmation packet for use by SBM 104 to respond to the multi-media call application’s call level bandwidth reservation/modification packet. For the illustrated embodiment, confirmation packet 332 includes common header 301, call family identifier 334, call identifier 336, endpoint identifier 338. Call family identifier 334, call identifier 336, and end-point identifier 338 have the same meanings as described earlier for call family identifier 324, call identifier 326, and end-point identifier 328.

Figure 3e illustrates one embodiment of a call level bandwidth request rejection packet for use by SBM 104 to respond to the multi-media call application's call level bandwidth reservation/modification packet. For the illustrated embodiment, rejection packet 342 includes common header 301, call family identifier 344, call identifier 346, endpoint identifier 348, rejection code 349 and bandwidth available 350. Call family identifier 344, call identifier 346, and end-point identifier 348 have the same meanings as like elements described earlier for reservation and confirmation packets 322 and 332. Rejection code 349 denotes the reason for rejection, and if the reason is for insufficient bandwidth, bandwidth available 350 denotes the amount of bandwidth available for reservation. **Figure 3f** illustrates one embodiment of a call disengage packet for use by multi-media application 112 to notify SBM 104 of the termination of the multi-media call. For the illustrated embodiment, call disengage packet 352 includes common header 301, call family identifier 354, call identifier 356 and endpoint identifier 358, having meanings similar to like elements of the other packets.

Figure 3g illustrates one embodiment of common header 301. For the illustrated embodiment, common header 301 includes version number 362, message type 364, and sequence number 366. Version number 362 denotes the version level of the protocol. Message type 364 denotes the nature of the message. In one embodiment, "1" denotes a discovery packet, "2" denotes a response packet, "3" denotes a reserve packet, "4" denotes a reserve confirmation packet, "5" denotes a reservation rejection packet, "6" denotes a modify packet, "7" denotes a modify confirmation packet, and "8" denotes a disengage packet. Sequence number 366 is a non-decreasing message number generated by the sender.

While the present invention has been described in terms of the above illustrated embodiments, those skilled in the art will recognize that the invention is not limited to the embodiments described. The present invention can be practiced with modification and alteration within the spirit and scope of the appended claims.

- 5 In particular, network **100** may have one or more client computers, one or more SBM (by segment), one or more routers, and so forth. The description is thus to be regarded as illustrative instead of restrictive on the present invention.

- 10 Thus, a method for ensuring the quality of service for a multi-media conference call using call associated individual media stream bandwidth control has been described.
-

CLAIMS

What is claimed is:

- 1 1. A storage medium having stored therein a plurality of programming
2 instructions executable by a processor, wherein when executed, the programming
3 instructions implement a multi-media call application that effectuate quality of
4 service (QOS) guaranty for a packet based multi-media call (CALL) through call
5 associated individual media stream bandwidth control.
- 1 2. The storage medium as set forth in Claim 1, wherein the programming
2 instructions determine if a sub-net bandwidth manager (SBM) that manages network
3 bandwidth is connected to a local area network (LAN) through which the CALL is
4 conducted, and if the SBM is connected to the LAN, register the CALL with the SBM
5 and reserve with the SBM bandwidth for subsequent allocation to media streams of
6 the CALL.
- 1 3. The storage medium as set forth in Claim 2, wherein the programming
2 instructions make the determination, registration and bandwidth reservation for
3 subsequent allocation to media streams of the CALL as an integral part of
4 establishing a connection for the CALL.
- 1 4. The storage medium as set forth in Claim 2, wherein the programming
2 instructions further subsequently cause the SBM to allocate the reserved bandwidth
3 for the CALL to individual media streams of the CALL.

1 5. The storage medium as set forth in Claim 4, wherein the programming
2 instructions invoke a bandwidth reservation service to request the SBM to allocate
3 the reserved bandwidth for the CALL to individual ones of the media streams of the
4 CALL, providing call level information to the bandwidth reservation service to enable
5 the bandwidth reservation service to include the call level information in the requests
6 for the SBM.

1 6. The storage medium as set forth in Claim 5, wherein the programming
2 instructions invoke the bandwidth reservation service to request the SBM to allocate
3 a portion of the reserved bandwidth for the CALL to an individual media stream of
4 the CALL while establishing an individual channel for the individual media stream
5 during the CALL.

1 7. The storage medium as set forth in Claim 1, wherein the CALL is an ITU-T
2 H.323 compatible video conference call.

1 8. The storage medium as set forth in Claim 7, wherein the programming
2 instructions further determine if a call level admission control gatekeeper is
3 connected to a local area network (LAN) through which the CALL is to be
4 conducted, and if the call level admission control gatekeeper is connected to the
5 LAN, register the CALL with the call level admission control gatekeeper, the
6 registration being made in a manner that causes the call level admission control
7 gatekeeper to determine whether to admit the CALL into the LAN without taking into
8 consideration bandwidth requirement of the CALL.

1 9. The storage medium as set forth in Claim 8, wherein the programming
2 instructions make the determination and conditional registration as an integral part
3 of establishing a connection for the CALL.

1 10. A storage medium having stored therein a plurality of programming
2 instructions executable by a processor, wherein when executed, the programming
3 instructions implementing a bandwidth reservation service that requests a sub-net
4 bandwidth manager (SBM) to allocate a portion of reserved bandwidth for a packet
5 based multi-media call (CALL) to an individual media stream of the CALL, providing
6 the SBM with call level information to allow the SBM to associate the individual
7 media stream of the CALL with the reserved bandwidth of the CALL, the SBM
8 managing network bandwidth of a local area network (LAN) through which the CALL
9 is conducted.

1 11. The storage medium as set forth in Claim 10, wherein the programming
2 instructions request the SBM to allocate a portion the reserved bandwidth of the
3 CALL to the individual media stream of the CALL while establishing an individual
4 channel for the individual media stream during the CALL.

1 12. The storage medium as set forth in Claim 10, wherein the programming
2 instructions are integral part of an operating system.

1 13. The storage medium as set forth in Claim 10, wherein the CALL is an ITU-T
2 H.323 compatible video conference call.

1 14. A method comprising:

2 (a) a multi-media call application first reserving bandwidth for media streams
3 of a packet based multi-media call (CALL) at a call level with a sub-net bandwidth
4 manager (SBM) that manages network bandwidth of a local area network (LAN)
5 through which the CALL is to be conducted; and

6 (b) the multi-media call application subsequently causing the SBM to allocate
7 the reserved bandwidth for the CALL to individual media streams of the CALL,
8 causing call level information to be provided to the SBM to enable the SBM to
9 associate the individual media streams of the CALL with the reserved bandwidth of
10 the CALL.

1 15. The method as set forth in Claim 14, wherein (a) is performed as an integral
2 part of the multi-media call application establishing a connection for the CALL.

1 16. The method as set forth in Claim 14, wherein (b) comprises the multi-media
2 call application invoking a bandwidth reservation service to request the SBM to
3 allocate the reserved bandwidth for the CALL to the individual media streams of the
4 CALL, providing the bandwidth reservation service with call level information for
5 inclusion in the requests to enable the SBM to associate the individual media
6 streams of the CALL with the CALL.

1 17. The method as set forth in Claim 16, wherein (b) is performed on a per
2 individual media stream basis as an integral part of establishing an individual
3 channel for the individual media stream.

1 18. The method as set forth in Claim 14, wherein the method further comprises
2 (c) the multi-media call application determining if a call level admission control
3 gatekeeper is connected to the LAN while establishing connection for the CALL.

1 19. The method as set forth in Claim 18, wherein if the call level admission
2 control gatekeeper is connected to the LAN, (c) further comprises the multi-media
3 application registering the CALL with the call level admission control gatekeeper in a
4 manner that causes the gatekeeper to determine whether to admit the CALL into the
5 LAN without taking into consideration bandwidth requirement of the CALL.

1 20. An apparatus comprising:
2 a storage medium having stored therein a plurality of programming
3 instructions implementing a multi-media call application that effectuates quality of
4 service (QOS) guaranty for a packet based multi-media call (CALL) using call
5 associated individual media stream bandwidth control; and
6 a processor coupled to the storage medium that operates to execute the
7 programming instructions.

1 21. The apparatus as set forth in Claim 20, wherein the programming instructions
2 determine if a sub-net bandwidth manager (SBM) that manages network bandwidth
3 is connected to a local area network (LAN) through which the CALL is conducted,
4 and if the SBM is connected to the LAN, register the CALL with the SBM and
5 reserve with the SBM bandwidth for subsequent allocation to media streams of the
6 CALL.

1 22. The apparatus as set forth in Claim 21, wherein the programming instructions
2 make the determination, registration and bandwidth reservation for subsequent
3 allocation to media streams of the CALL as an integral part of establishing a
4 connection for the CALL.

1 23. The apparatus as set forth in Claim 21, wherein the programming instructions
2 further subsequently cause the SBM to allocate the reserved bandwidth for the
3 CALL to individual media streams of the CALL.

1 24. The apparatus as set forth in Claim 23, wherein the programming instructions
2 invoke a bandwidth reservation service to request the SBM to allocate the reserved
3 bandwidth for the CALL to individual ones of the media streams of the CALL,
4 providing call level information to the bandwidth reservation service to enable the
5 bandwidth reservation service to include the call level information in the requests for
6 the SBM.

1 25. The storage medium as set forth in Claim 24, wherein the programming
2 instructions invoke the bandwidth reservation service to request the SBM to allocate
3 a portion of the reserved bandwidth for the CALL to an individual media stream of
4 the CALL while establishing an individual channel for the individual media stream
5 during the CALL.

1 26. An apparatus comprising:
2 a storage medium having stored therein a plurality of programming
3 instructions implementing a bandwidth reservation service that requests a sub-net
4 bandwidth manager (SBM) to allocate a portion of reserved bandwidth for a packet

5 based multi-media call (CALL) to an individual media stream of the CALL, providing
6 the SBM with call level information to allow the SBM to associate the individual
7 media stream of the CALL with the reserved bandwidth of the CALL, the SBM
8 managing network bandwidth of a local area network (LAN) through which the CALL
9 is conducted; and

10 a processor coupled to the storage medium that operates to execute the
11 programming instructions.

1 27. The apparatus as set forth in Claim 26, wherein the programming instructions
2 request the SBM to allocate a portion the reserved bandwidth of the CALL to the
3 individual media stream of the CALL while establishing an individual channel for the
4 individual media stream during the CALL.

1 28. The apparatus as set forth in Claim 26, wherein the programming instructions
2 are integral part of an operating system.

1

ABSTRACT OF THE DISCLOSURE

5 A multi-media call application is disclosed. The application guarantees quality of service (QOS) for a packet based multi-media call (CALL). The guaranty is effectuated through call associated individual media stream bandwidth control.

42390.P4264

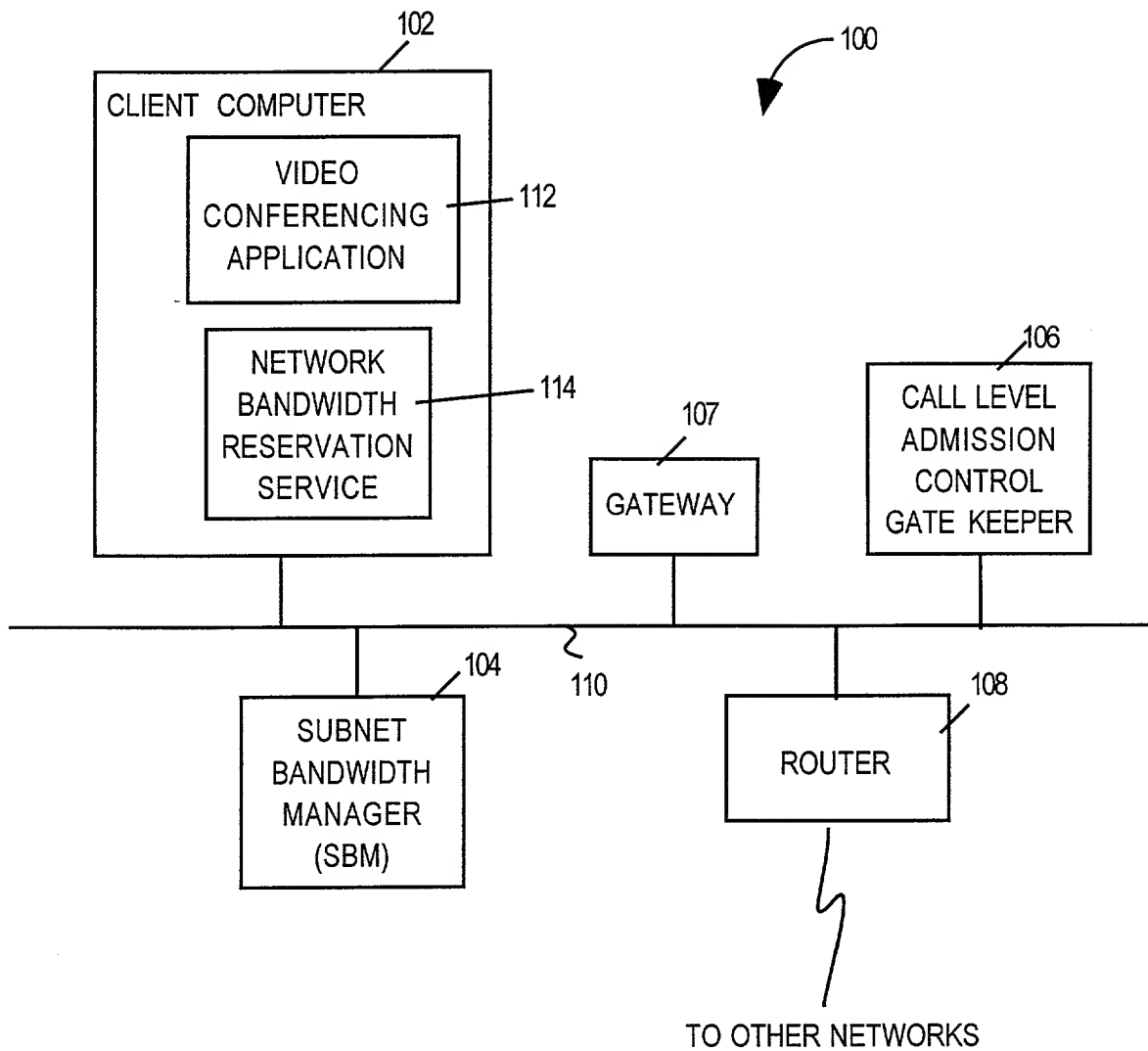


Figure 1

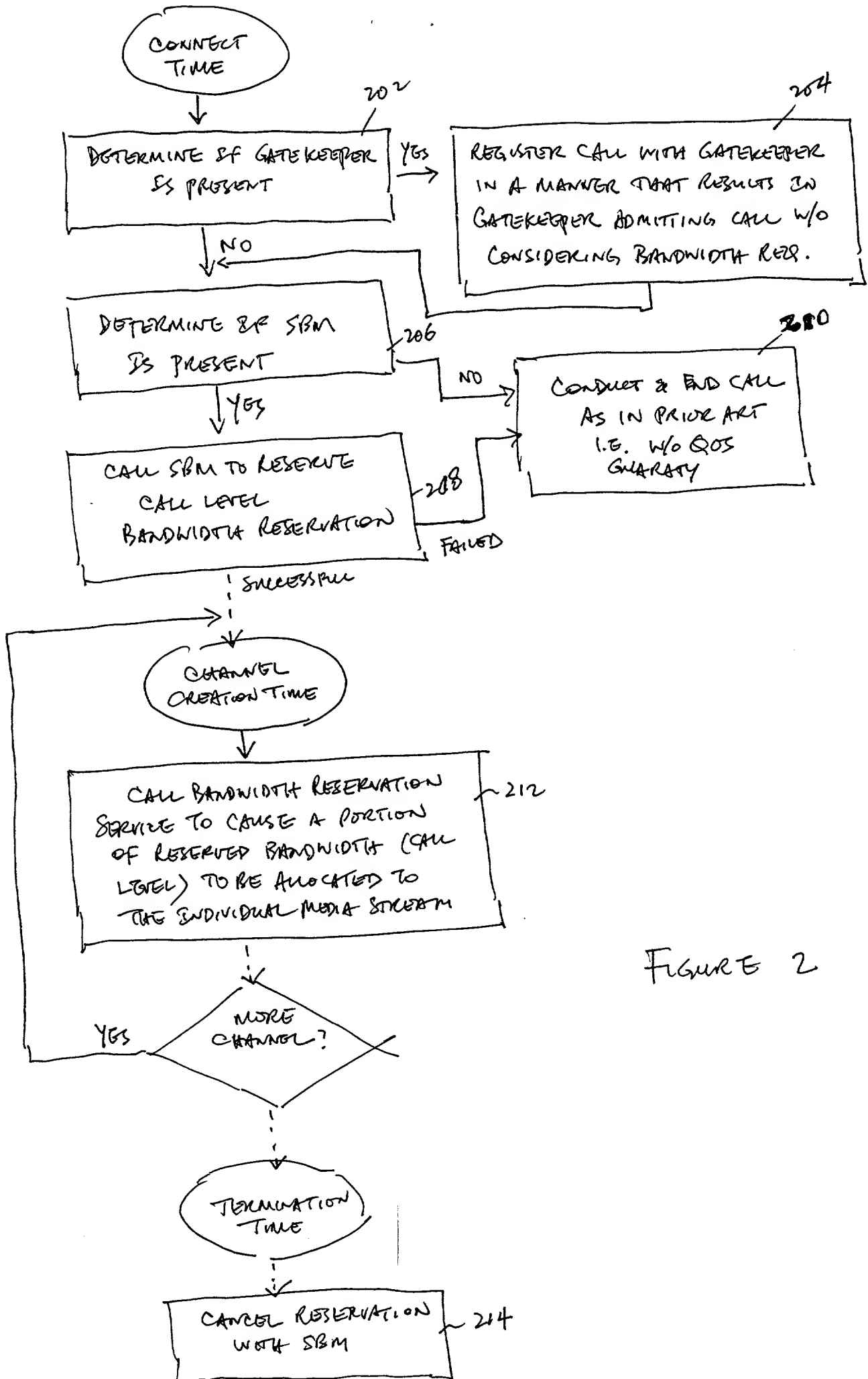


FIGURE 2

SBM DISCOVERY PACKET

302

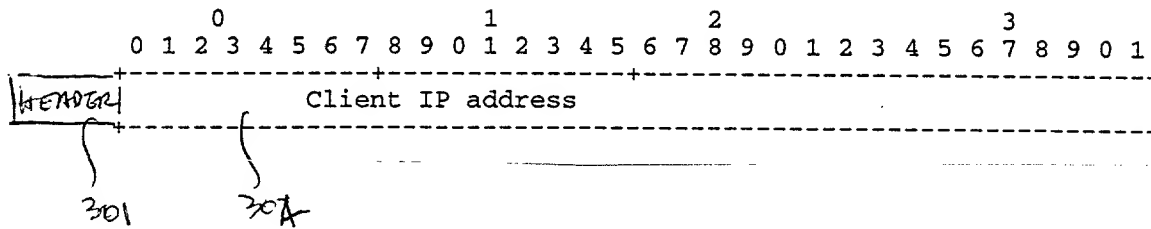


FIGURE 3A

SBM RESPONSE PACKET

312

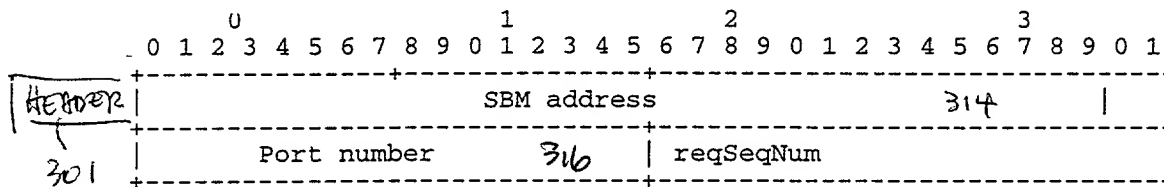


FIGURE 3B

SBM RESERVE/MODIFY PACKET

322

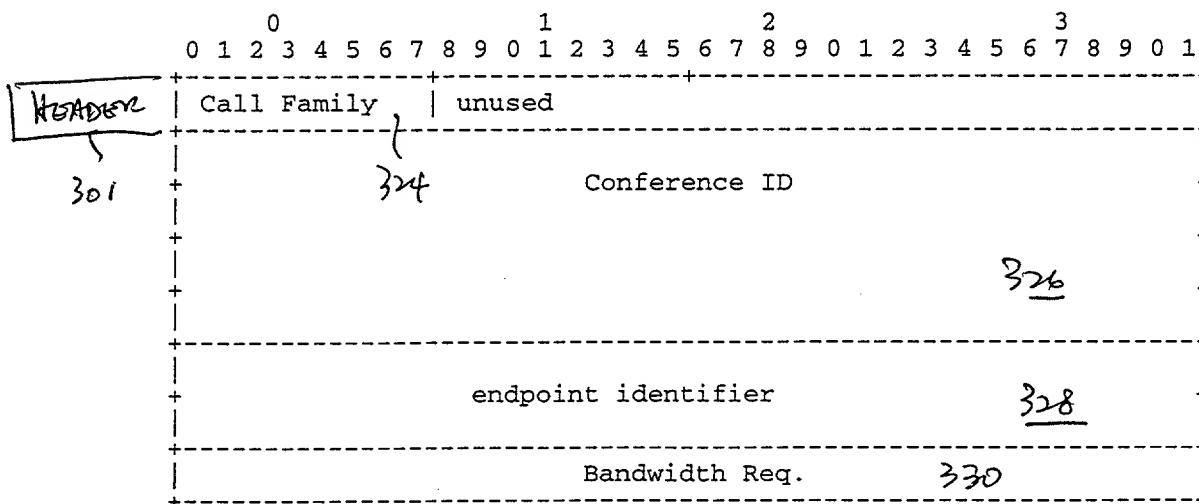


FIGURE 3C

SBM CONFIRM PACKET

332

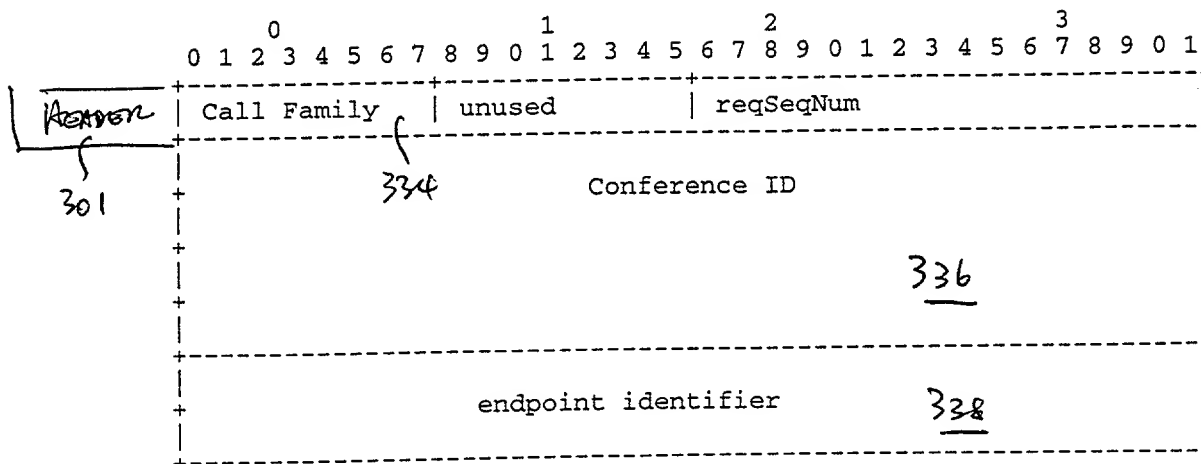


FIGURE 3d

SBM REJECTION PACKET

342

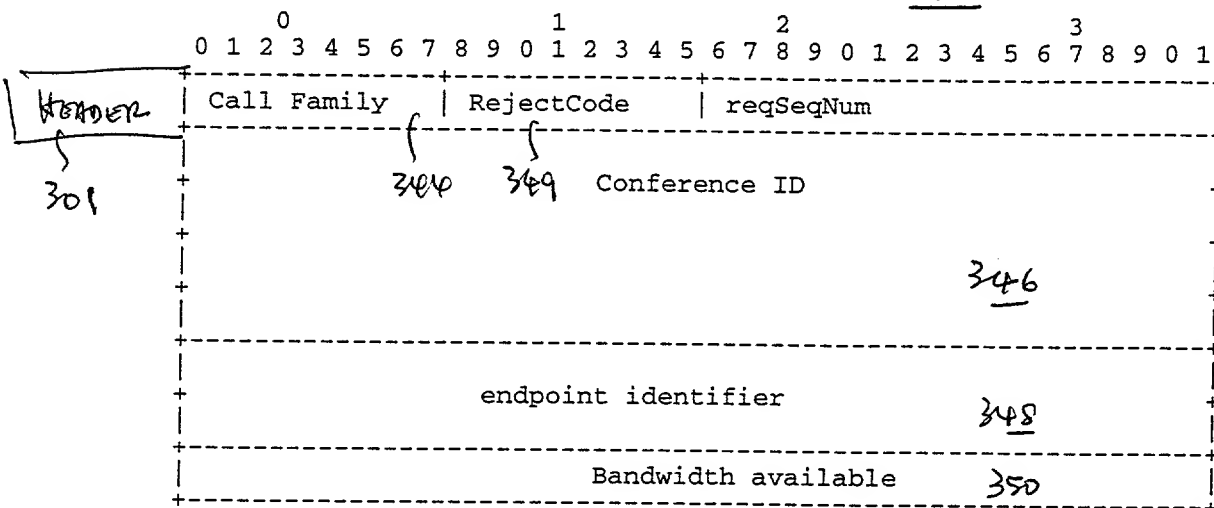


FIGURE 3e

SBM DISENGAGE PACKET

352

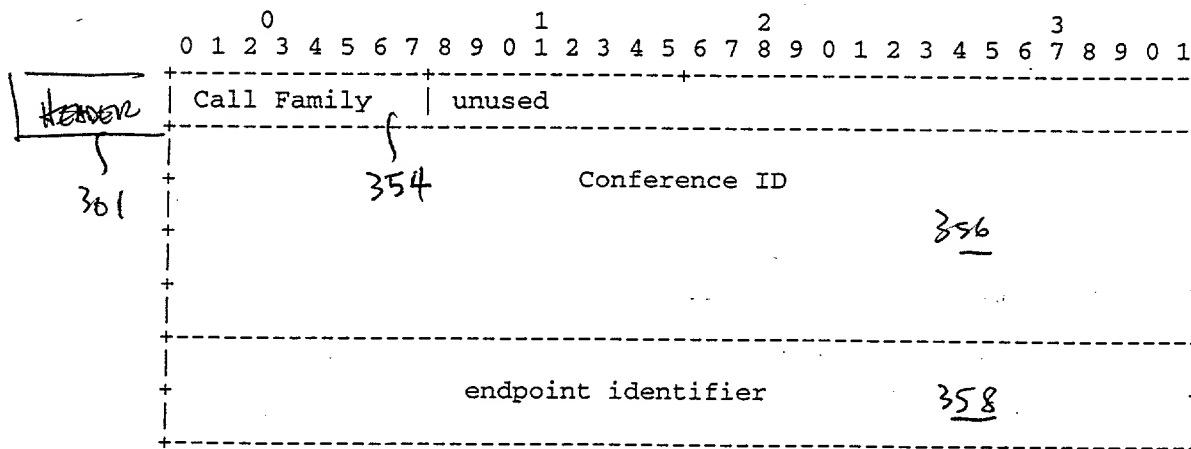


FIGURE 3f

965700 6264060

Common Header

201 ;

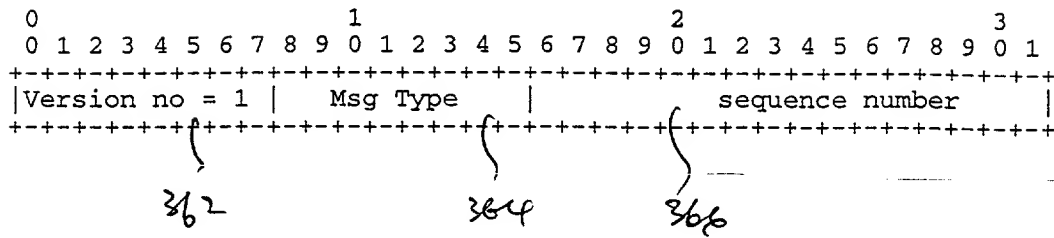


FIGURE 3g

PATENT

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION
(FOR INTEL CORPORATION PATENT APPLICATIONS)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

ENSURING QUALITY OF SERVICE (QOS) FOR A MULTI-MEDIA CALL THROUGH CALL ASSOCIATED INDIVIDUAL MEDIA STREAM BANDWIDTH CONTROL

the specification of which

[illegible]

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above. I do not know and do not believe that the claimed invention was ever known or used in the United States or America before my invention thereof, or patented or described in any printed publication in any country before my invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, and that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months (for a utility patent application) or six months (for a design patent application) prior to this application.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Priority
Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
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(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
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(Application Number) Filing Date

(Application Number) Filing Date

(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
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(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
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I hereby appoint Aloysius T. C. AuYeung, Reg. No. 35,432; William Thomas Babbitt, Reg. No. 39,591; Jordan Michael Becker, Reg. No. 39,602; Bradley J. Berezna, Reg. No. 33,474; Michael A. Bernadicou, Reg. No. 35,934; Roger W. Blakely, Jr., Reg. No. 25,831; Gregory D. Caldwell, Reg. No. 39,926; Kent M. Chen, Reg. No. 39,630; Lawrence M. Cho, Reg. No. 39,942; Thomas M. Coester, Reg. No. 39,637; Roland B. Cortes, Reg. No. 39,152; William Donald Davis, Reg. No. 38,428; Michael Anthony DeSanctis, Reg. No. 39,957; Daniel M. De Vos, Reg. No. 37,813; Tarek N. Fahmi, Reg. No. 41,402; James Y. Go, Reg. No. 40,621; Sharmini Nathan Green, Reg. No. 41,410; David R. Halvorson, Reg. No. 33,395; Eric Ho, Reg. No. 39,711; George W. Hoover II, Reg. No. 32,992; Eric S. Hyman, Reg. No. 30,139; Dag H. Johansen, Reg. No. 36,172; Stephen L. King, Reg. No. 19,180; Michael J. Mallie, Reg. No. 36,591; Paul A. Mendonsa, Reg. No. P-42,879; Kimberley G. Nobles, Reg. No. 38,255; Ronald W. Reagin, Reg. No. 20,340; James H. Salter, Reg. No. 35,668; William W. Schaal, Reg. No. 39,018; James C. Scheller, Reg. No. 31,195; Charles E. Shemwell, Reg. No. 40,171; Maria McCormack Sobrino, Reg. No. 31,639; Stanley W. Sokoloff, Reg. No. 25,128; Allan T. Sponseller, Reg. No. 38,318; Steven R. Sponseller, Reg. No. 39,384; Judith A. Szepesi, Reg. No. 39,393; Edwin H. Taylor, Reg. No. 25,129; George G. C. Tseng, Reg. No. 41,355; Lester J. Vincent, Reg. No. 31,460; John Patrick Ward, Reg. No. 40,216; Ben J. Yorks, Reg. No. 33,609; and Norman Zafman, Reg. No. 26,250; my attorneys; and Robert Andrew Diehl, Reg. No. 40,992; Thomas A. Hassing, Reg. No. 36,159; and Edwin A. Sloane, Reg. No. 34,728; my patent agents, of BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP, with offices located at 12400 Wilshire Boulevard, 7th Floor, Los Angeles, California 90025, telephone (310) 207-3800, and Joseph R. Bond, Reg. No. 36,458; Richard C. Calderwood, Reg. No. 35,468; Sean Fitzgerald, Reg. No. 32,027; David J. Kaplan, Reg. No. 41,105; Leo V. Novakoski, Reg. No. 37,198; Naomi Obinata, Reg. No. 39,320; Thomas C. Reynolds, Reg. No. 32,488; Steven P. Skabrat, Reg. No. 36,279; Howard A. Skaist, Reg. No. 36,008; Steven C. Stewart, Reg. No. 33,555; Raymond J. Werner, Reg. No. 34,752; Seth Z. Kalson, Reg. No. 40,670; and Charles K. Young, Reg. No. 39,435; my patent attorneys, of INTEL CORPORATION; and James R. Thein, Reg. No. 31,710, my patent attorney; with full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith.

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telephone calls to Aloysius T. C. AuYeung, (503) 684-6200.
(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Residence _____ Citizenship _____
(City, State) (Country)
Post Office Address _____